

Exercise 2.2a(H)

Metric Conversions

Name: _____

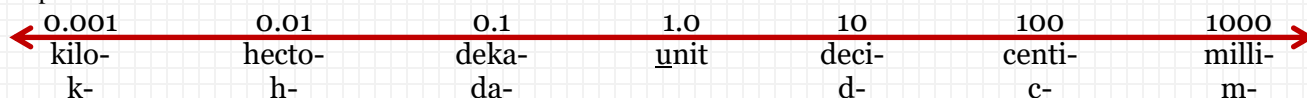
Date: _____ Per: _____

There are only a small number of metric units used to measure everything. The powerful part of the SI system is that these units may be made larger or smaller by simply using a prefix in front of the unit name. These prefixes change the magnitude of the unit by multiplying by a power of ten. To convert between measurements of a unit that have different prefixes, it only requires that the decimal be moved.

The most common prefixes used in chemistry are kilo- (1000), deci- (1/10), centi- (1/100) and milli- (1/1000). There are prefixes for 10 (deka-) and 100 (hecto-), but we usually don't use them. The simplest way to convert between prefixes is to use a number line system that shows how the decimal place moves as the prefix is changed. A mnemonic (memory device) for the prefixes is:

“king hector d(a)oesn't [usually] drink chocolate milk”

The first letter(s) represents the prefix. The [using] represents the unit without a prefix applied. Placed on a number line, the prefixes look like this.



To use the line, simply start at the spot on the line that represents the prefix of the measure you want to convert and count over to the prefix you want to convert to. Move the decimal place of your measurement that many places in that direction.

Directions: Convert the following:

- | | | | | | |
|--------------|----|----------|---------------|----|----------|
| 1. 12.3 mL | to | _____ L | 21. 1.52 m | to | _____ km |
| 2. 1.45 kg | to | _____ g | 22. 1.46 mL | to | _____ L |
| 3. 0.0023 kg | to | _____ mg | 23. 1.54 km | to | _____ dm |
| 4. 4.09 km | to | _____ m | 24. 0.01 m | to | _____ cm |
| 5. 5.0128 m | to | _____ cm | 25. 6.82 kg | to | _____ g |
| 6. 0.34856 m | to | _____ mm | 26. 122.91 cm | to | _____ m |
| 7. 1.562 mg | to | _____ kg | 27. 245 cm | to | _____ mm |
| 8. 0.00001 m | to | _____ cm | 28. 1500 mg | to | _____ kg |
| 9. 2.8978 m | to | _____ mm | 29. 3.45 kg | to | _____ g |
| 10. 12.5 cm | to | _____ m | 30. 8.99 J | to | _____ mJ |
| 11. 153.2 m | to | _____ km | 31. 9.33 ms | to | _____ s |
| 12. 0.001 m | to | _____ cm | 32. 45.900 kA | to | _____ A |
| 13. 56.78 L | to | _____ kL | 33. 39.77 cN | to | _____ N |
| 14. 78.3 kg | to | _____ g | 34. 32.67 cJ | to | _____ J |
| 15. 123 cm | to | _____ m | 35. 45.34 daL | to | _____ L |
| 16. 4.31 dL | to | _____ kL | 36. 9.01 mL | to | _____ kL |
| 17. 100 cm | to | _____ m | 37. 0.11 L | to | _____ mL |
| 18. 17.8 mg | to | _____ cg | 38. 1000 mg | to | _____ g |
| 19. 100 ms | to | _____ s | 39. 23.01 kJ | to | _____ cJ |
| 20. 1.25 cm | to | _____ m | 40. 45 000 cm | to | _____ m |

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The factor-label method is a way of converting units by using a series of conversion factors that are expressed as fractions and arranged so that units cross cancel from numerator to denominator until only the desired set of units is reached. For example, the measurement 25 grams per liter (g/L) may be converted to kilograms per milliliter (kg/mL) by the following:

$$\frac{25 \text{ grams}}{\text{liter}} \times \frac{1 \text{ liter}}{1000 \text{ milliliters}} \times \frac{1 \text{ kilogram}}{1000 \text{ grams}} = 0.000025 \text{ kilograms/milliliter}$$

Typically, in order to save space and time the symbols rather than the names of the units are used.

$$\frac{25 \text{ g}}{\text{L}} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{1 \text{ kg}}{1000 \text{ g}} = 0.000025 \text{ kg/mL}$$

Directions: Complete the following in the space provided:

- | | | |
|--------------------|---------------------|---------------------|
| 1. 1 km = _____ m | 5. 1 km = _____ dam | 9. 1 hm = _____ dam |
| 2. 1 dam = _____ m | 6. 1 m = _____ dm | 10. 1 hm = _____ m |
| 3. 1 m = _____ cm | 7. 1 m = _____ mm | 11. 1 cm = _____ mm |
| 4. 1 km = _____ hm | 8. 1 dm = _____ mm | 12. 1 dm = _____ cm |

Directions: Complete the following one-step conversions:

- | | |
|---|---|
| 1. $\frac{1.276 \text{ km}}{\quad} \times \frac{1000 \text{ m}}{1 \text{ km}} = 1276 \text{ m}$ | 5. $\frac{12.77 \text{ cm}}{\quad} = \quad \text{m}$ |
| 2. $\frac{4.5 \text{ dL}}{\quad} = \quad \text{L}$ | 6. $\frac{1.2008 \text{ kA}}{\quad} = \quad \text{A}$ |
| 3. $\frac{0.0098 \text{ km}}{\quad} = \quad \text{m}$ | 7. $\frac{1.125 \text{ cL}}{\quad} = \quad \text{L}$ |
| 4. $\frac{908\,876 \text{ g}}{\quad} = \quad \text{cg}$ | 8. $\frac{7.4 \text{ mm}}{\quad} = \quad \text{cm}$ |

Directions: Complete the following two-step conversions:

- | | |
|--|---|
| 9. $\frac{1.276 \text{ km}}{\quad} \times \frac{1000 \text{ m}}{1 \text{ km}} \times \frac{100 \text{ cm}}{1 \text{ m}} = 127600 \text{ cm}$ | 13. $\frac{12.77 \text{ days}}{\quad} = \quad \text{min}$ |
| 10. $\frac{4.5 \text{ kL}}{\quad} \times \frac{\text{L}}{\text{kL}} \times \frac{\text{mL}}{\text{L}} = \quad \text{mL}$ | 14. $\frac{12\,008 \text{ sec}}{\quad} = \quad \text{hr}$ |
| 11. $\frac{0.0098 \text{ km}}{\quad} \times \frac{\text{m}}{\text{km}} \times \frac{\text{mm}}{\text{m}} = \quad \text{mm}$ | 15. $\frac{1.125 \text{ cL}}{\quad} = \quad \text{kL}$ |
| 12. $\frac{8\,876 \text{ min}}{\quad} \times \frac{\text{hr}}{\text{min}} \times \frac{\text{day}}{\text{hr}} = \quad \text{day}$ | 16. $\frac{7.4 \text{ hm}}{\quad} = \quad \text{cm}$ |

Directions: Complete the following conversions:

- 13 widgets (W) = 230 thingamajigs (TM)
 15 thingamajigs (TM) = 20 doohickies (DH)
 30 doohickies (DH) = 45 whatchmacallits (WM)

- | | |
|---|---|
| 17. $\frac{176 \text{ W}}{\quad} = \quad \text{DH}$ | 18. $\frac{127 \text{ WM}}{\quad} = \quad \text{W}$ |
|---|---|